OIPE IAP79 NOV 0 2 2006 PATENT & TRADEMARK OFFICE

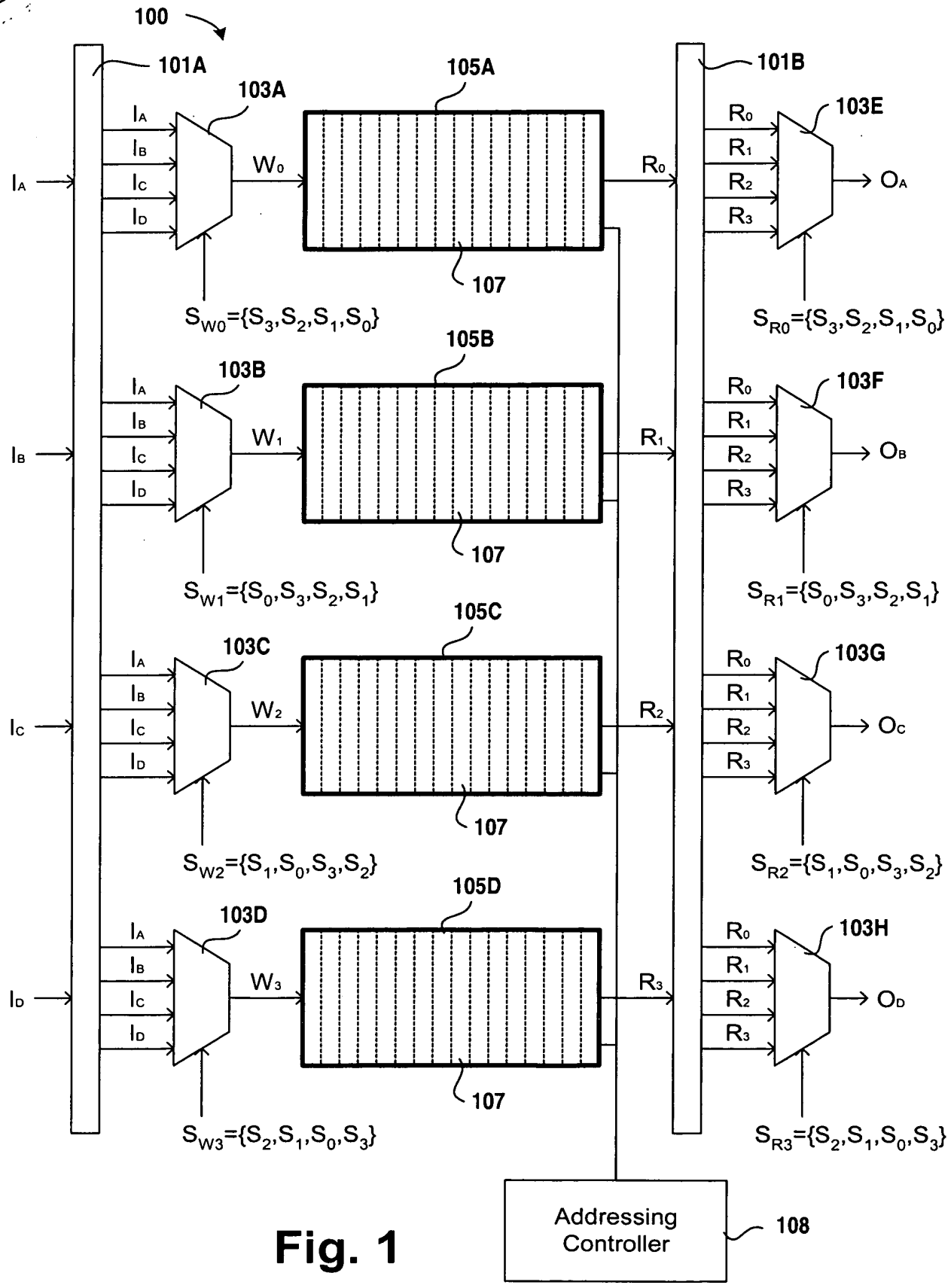

Fig. 1

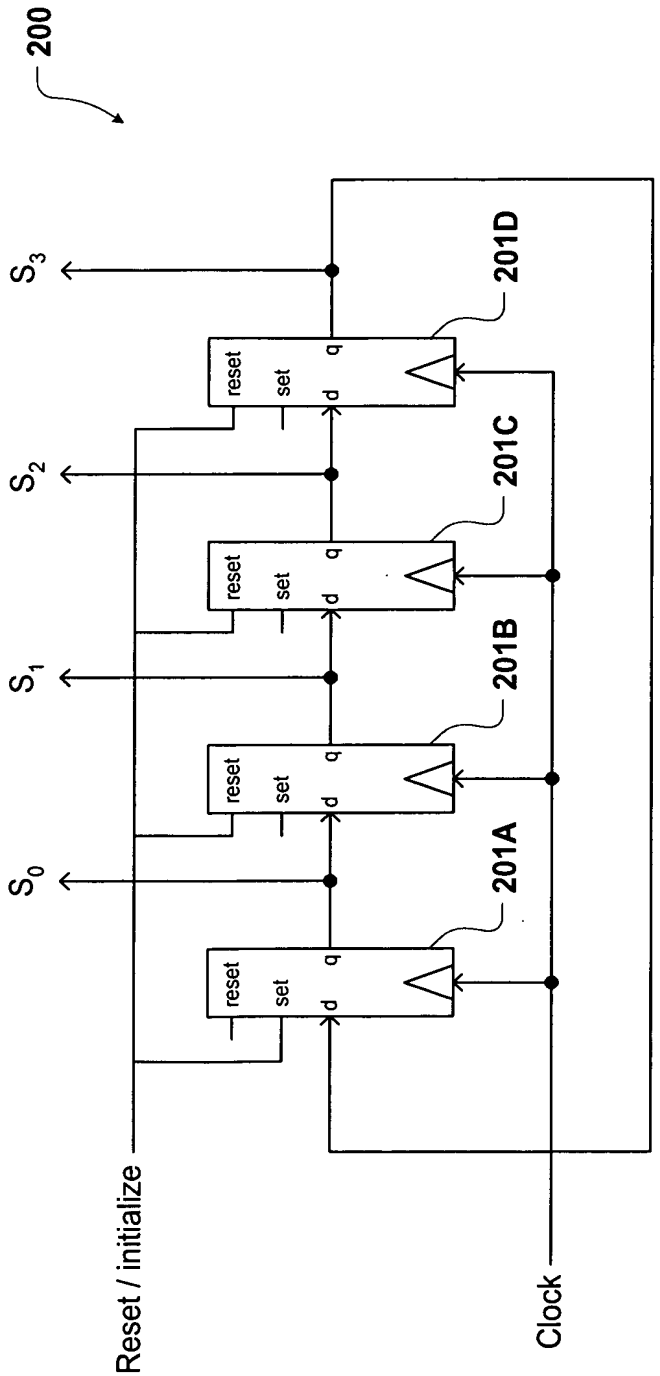
200
S_3
S_2
S_1
S_0
201D
201C
201B
201A
reset
set
d
q
Reset / initialize
Clock

Fig. 2

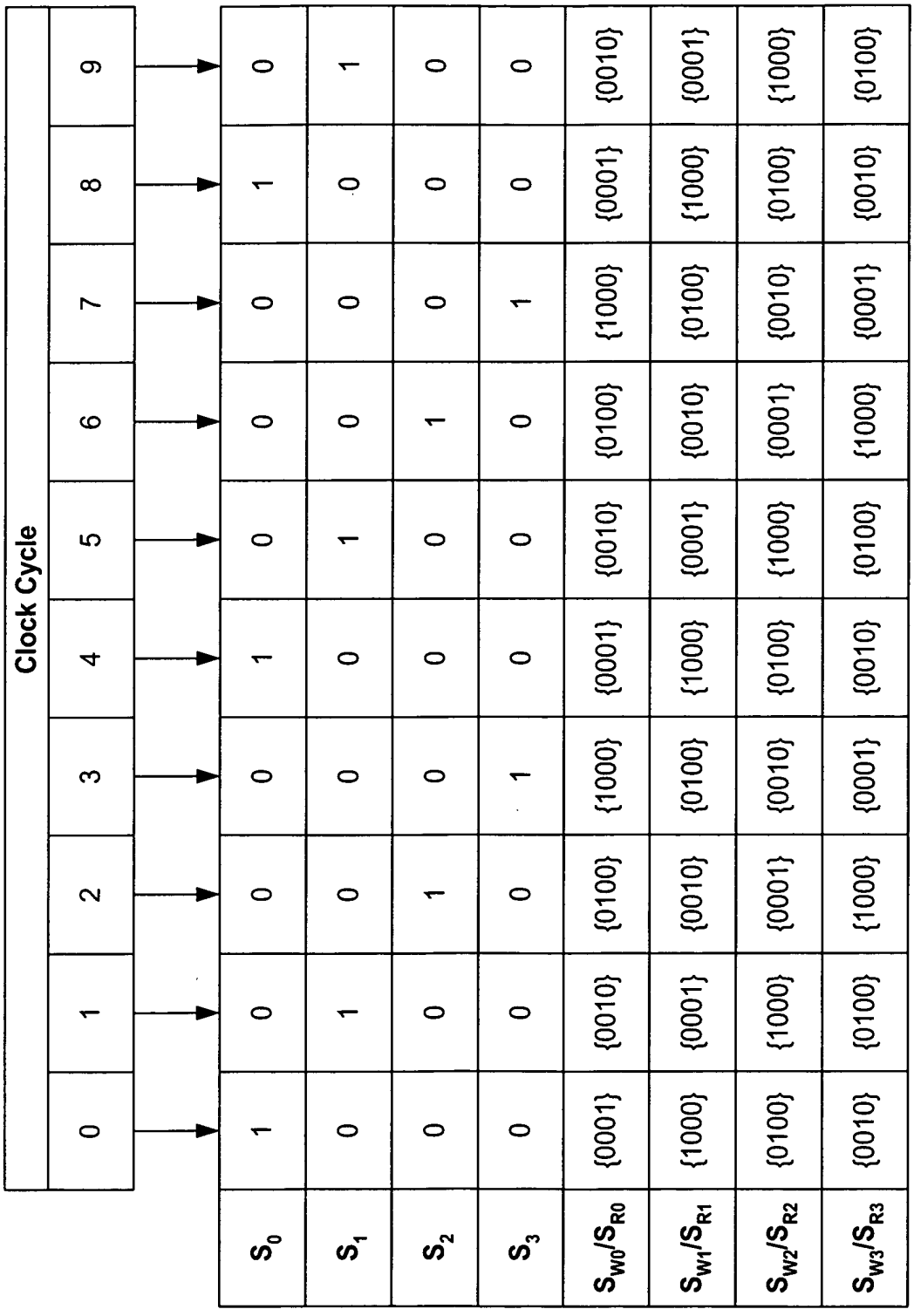
Clock Cycle
0 1 2 3 4 5 6 7 8 9
S_0 1 0 0 0 1 0 0 0 1 0
S_1 0 1 0 0 0 1 0 0 0 1
S_2 0 0 1 0 0 0 1 0 0 0
S_3 0 0 0 1 0 0 0 1 0 0
S_{W0}/S_{R0} {0001} {0010} {0100} {1000} {0001} {0010} {0100} {1000} {0001} {0010}
S_{W1}/S_{R1} {1000} {0001} {0010} {0100} {1000} {0001} {0010} {0100} {1000} {0001}
S_{W2}/S_{R2} {0100} {1000} {0001} {0010} {0100} {1000} {0001} {0010} {0100} {1000}
S_{W3}/S_{R3} {0010} {0100} {1000} {0001} {0010} {0100} {1000} {0001} {0010} {0100}

Fig. 3

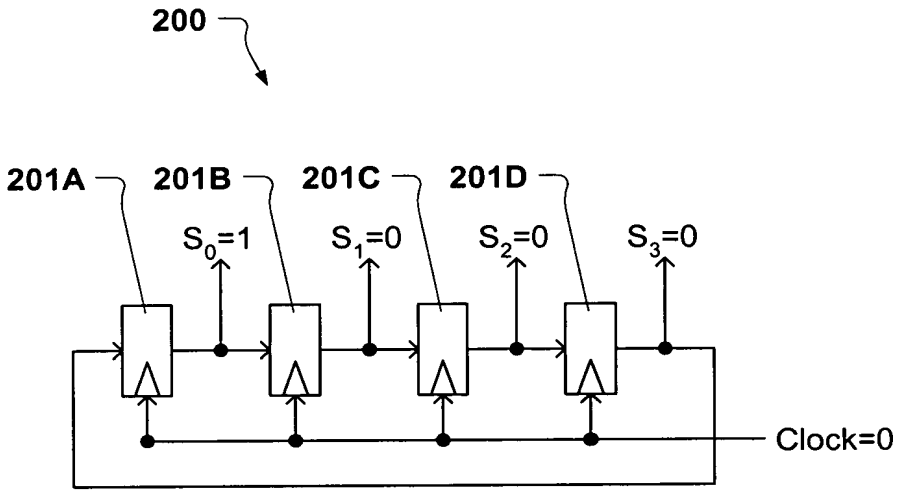

Fig. 4A

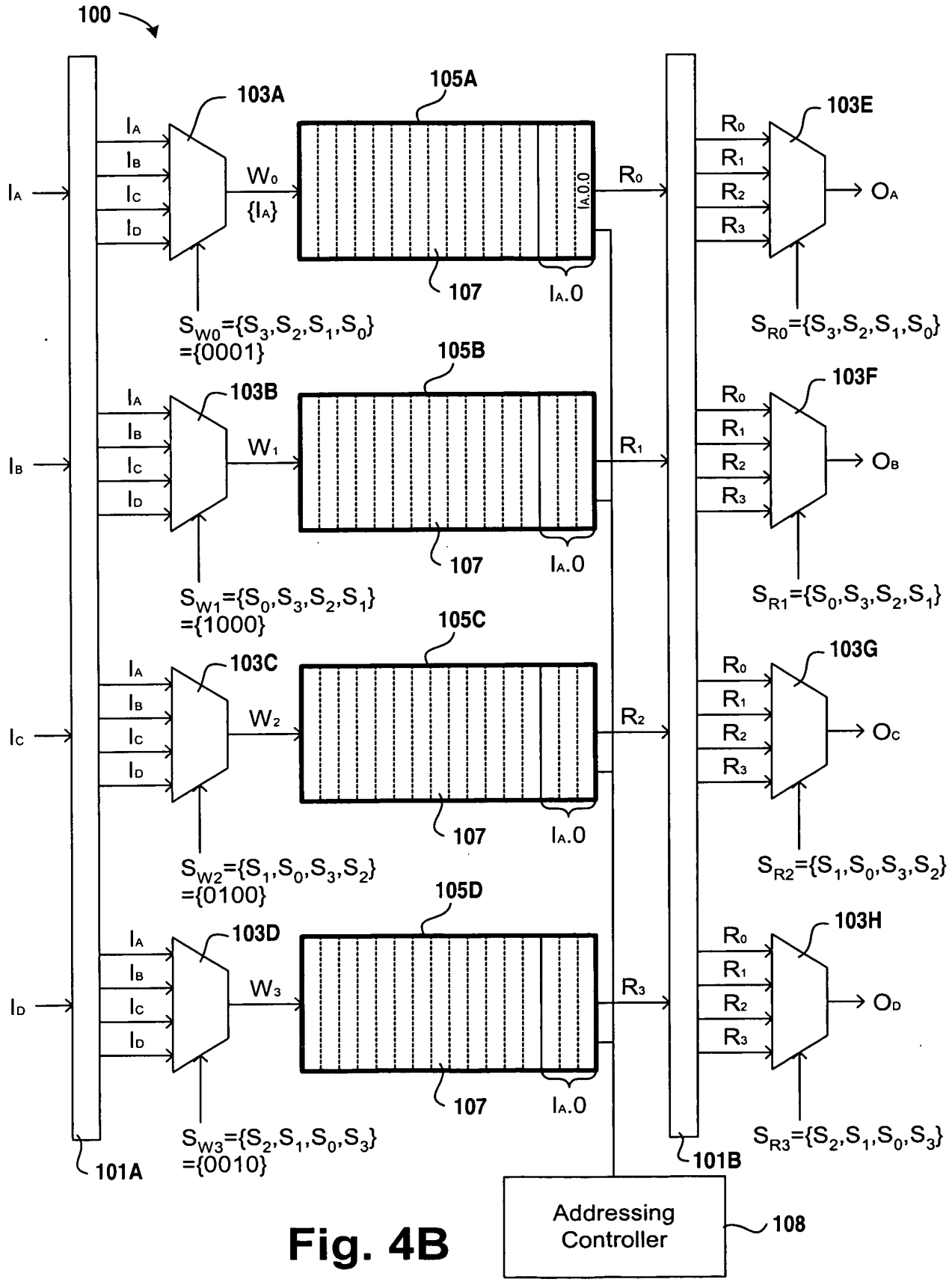
100
103A
105A
103E
I_A
I_B
I_C
I_D
W_0
$\{I_A\}$
$I_{A.0.0}$
R_0
R_1
R_2
R_3
O_A
107
$I_A.0$
$S_{W0}=\{S_3,S_2,S_1,S_0\}$
$=\{0001\}$
$S_{R0}=\{S_3,S_2,S_1,S_0\}$
105B
103B
103F
W_1
O_B
$S_{W1}=\{S_0,S_3,S_2,S_1\}$
$=\{1000\}$
$S_{R1}=\{S_0,S_3,S_2,S_1\}$
105C
103C
103G
W_2
O_C
$S_{W2}=\{S_1,S_0,S_3,S_2\}$
$=\{0100\}$
$S_{R2}=\{S_1,S_0,S_3,S_2\}$
105D
103D
103H
W_3
O_D
$S_{W3}=\{S_2,S_1,S_0,S_3\}$
$=\{0010\}$
$S_{R3}=\{S_2,S_1,S_0,S_3\}$
101A
101B
Addressing Controller
108

Fig. 4B

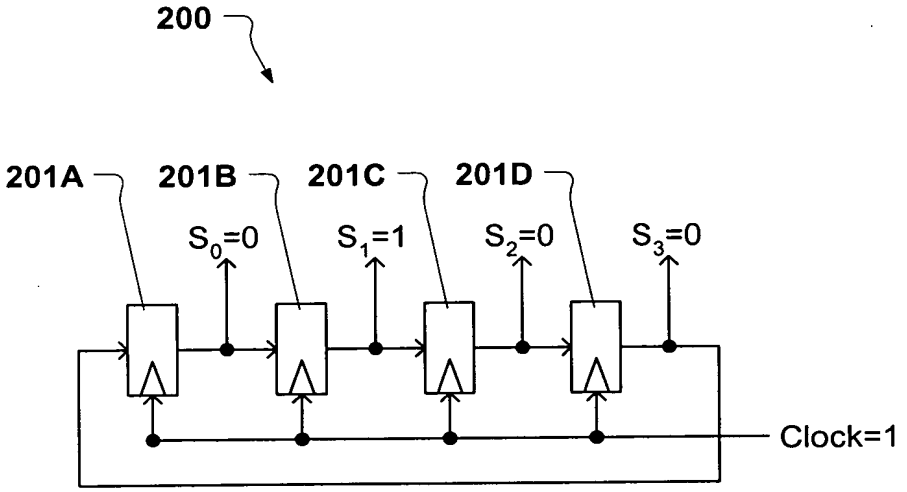

Fig. 5A

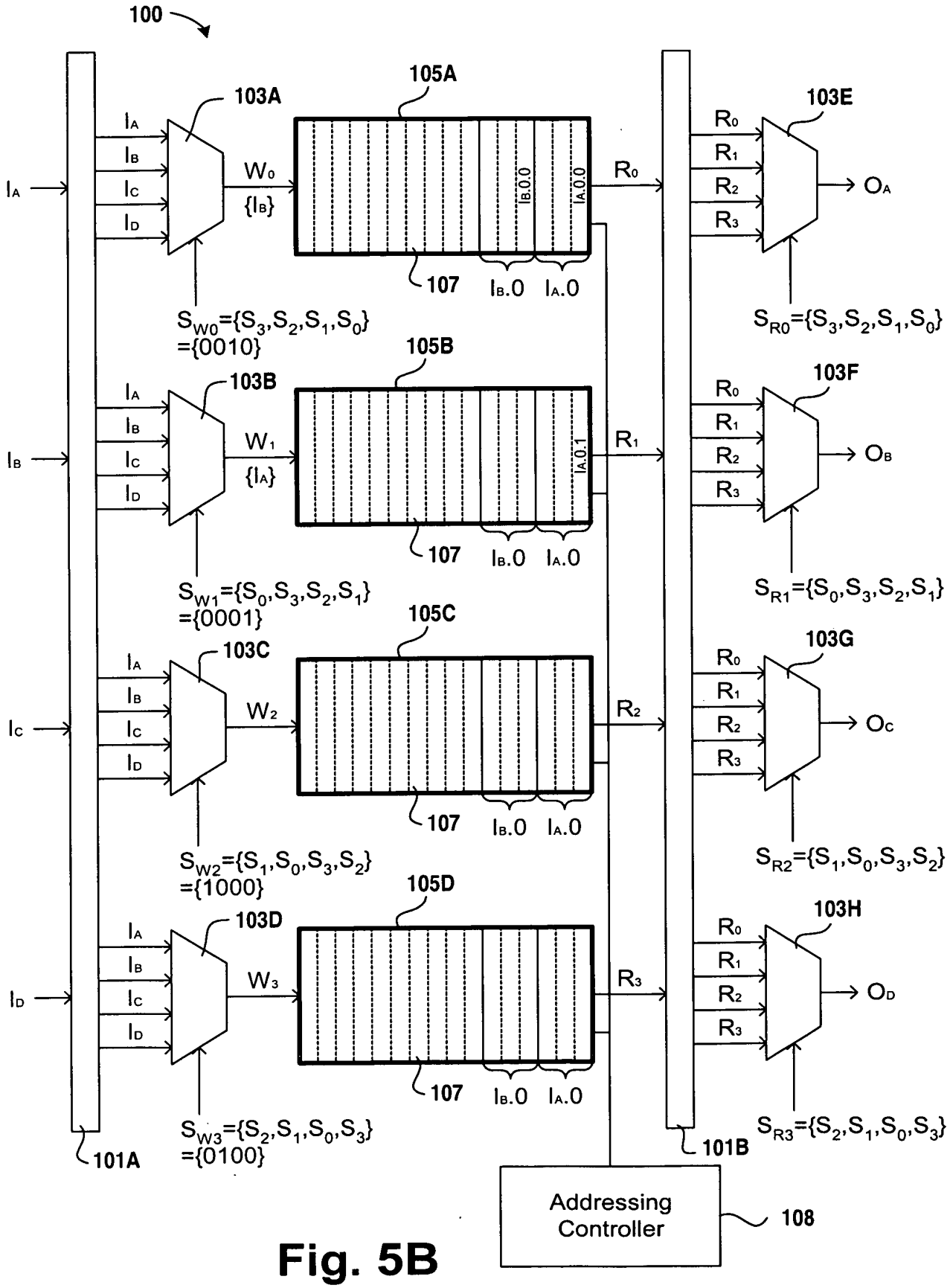
100
103A
105A
103E
I_A
I_B
I_C
I_D
W_0
$\{I_B\}$
$I_{B.0.0}$
$I_{A.0.0}$
R_0
R_1
R_2
R_3
O_A
107
$I_B.0$
$I_A.0$
$S_{W0}=\{S_3,S_2,S_1,S_0\}$
$=\{0010\}$
$S_{R0}=\{S_3,S_2,S_1,S_0\}$
103B
105B
103F
W_1
$\{I_A\}$
$I_{A.0.1}$
O_B
$S_{W1}=\{S_0,S_3,S_2,S_1\}$
$=\{0001\}$
$S_{R1}=\{S_0,S_3,S_2,S_1\}$
103C
105C
103G
W_2
O_C
$S_{W2}=\{S_1,S_0,S_3,S_2\}$
$=\{1000\}$
$S_{R2}=\{S_1,S_0,S_3,S_2\}$
103D
105D
103H
W_3
O_D
$S_{W3}=\{S_2,S_1,S_0,S_3\}$
$=\{0100\}$
$S_{R3}=\{S_2,S_1,S_0,S_3\}$
101A
101B
Addressing Controller
108

Fig. 5B

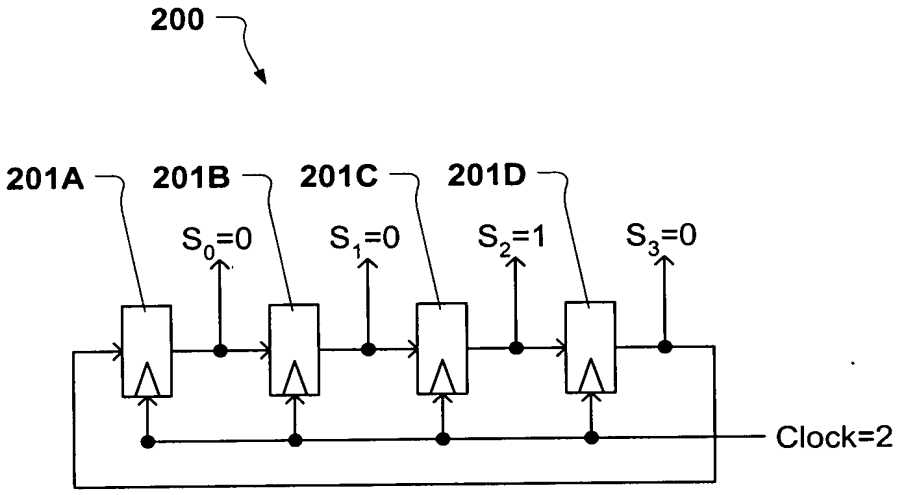

Fig. 6A

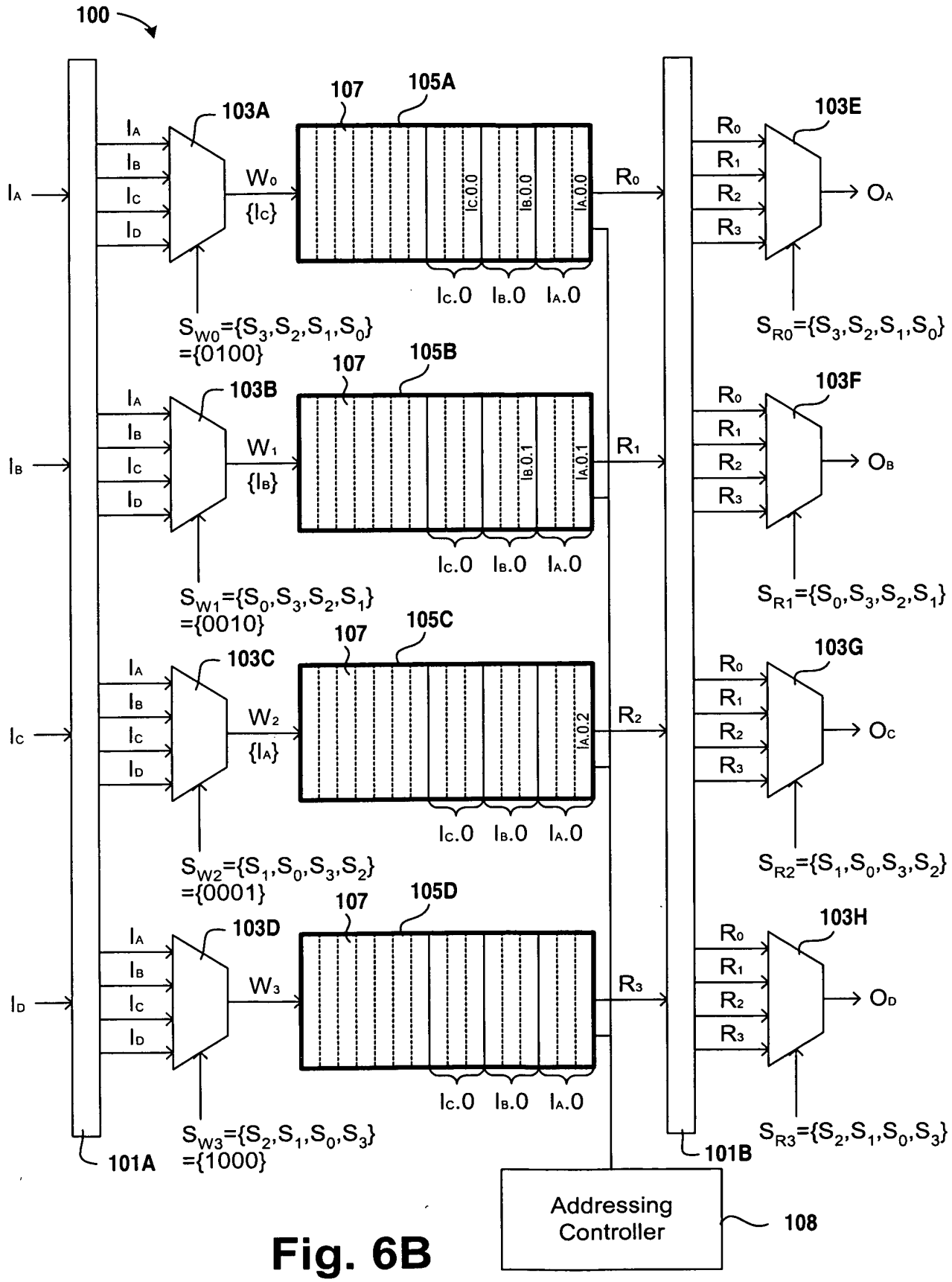
100
103A
105A
107
103B
105B
103C
105C
103D
105D
103E
103F
103G
103H
I_A
I_B
I_C
I_D
W_0
W_1
W_2
W_3
R_0
R_1
R_2
R_3
O_A
O_B
O_C
O_D
$I_C.0$ $I_B.0$ $I_A.0$
$I_C.0.0$ $I_B.0.0$ $I_A.0.0$
$I_B.0.1$ $I_A.0.1$
$I_A.0.2$
$S_{W0}=\{S_3,S_2,S_1,S_0\}=\{0100\}$
$S_{W1}=\{S_0,S_3,S_2,S_1\}=\{0010\}$
$S_{W2}=\{S_1,S_0,S_3,S_2\}=\{0001\}$
$S_{W3}=\{S_2,S_1,S_0,S_3\}=\{1000\}$
$S_{R0}=\{S_3,S_2,S_1,S_0\}$
$S_{R1}=\{S_0,S_3,S_2,S_1\}$
$S_{R2}=\{S_1,S_0,S_3,S_2\}$
$S_{R3}=\{S_2,S_1,S_0,S_3\}$
101A
101B
Addressing Controller
108

Fig. 6B

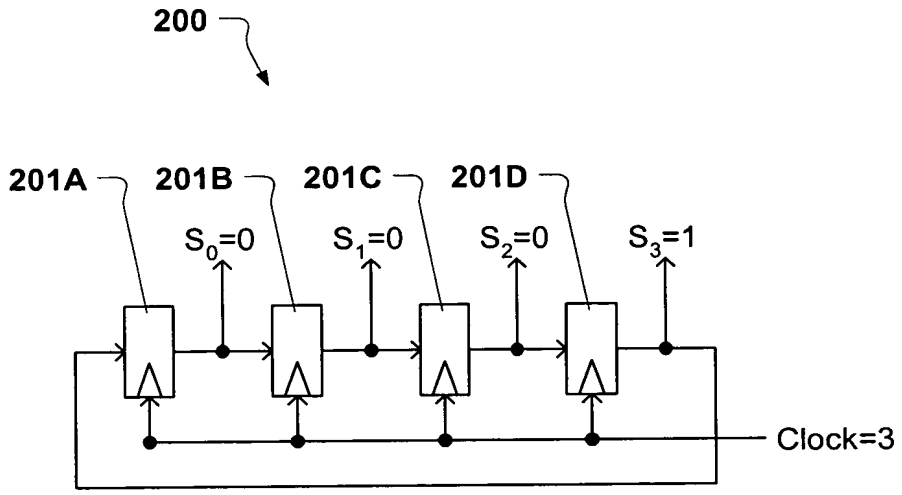

Fig. 7A

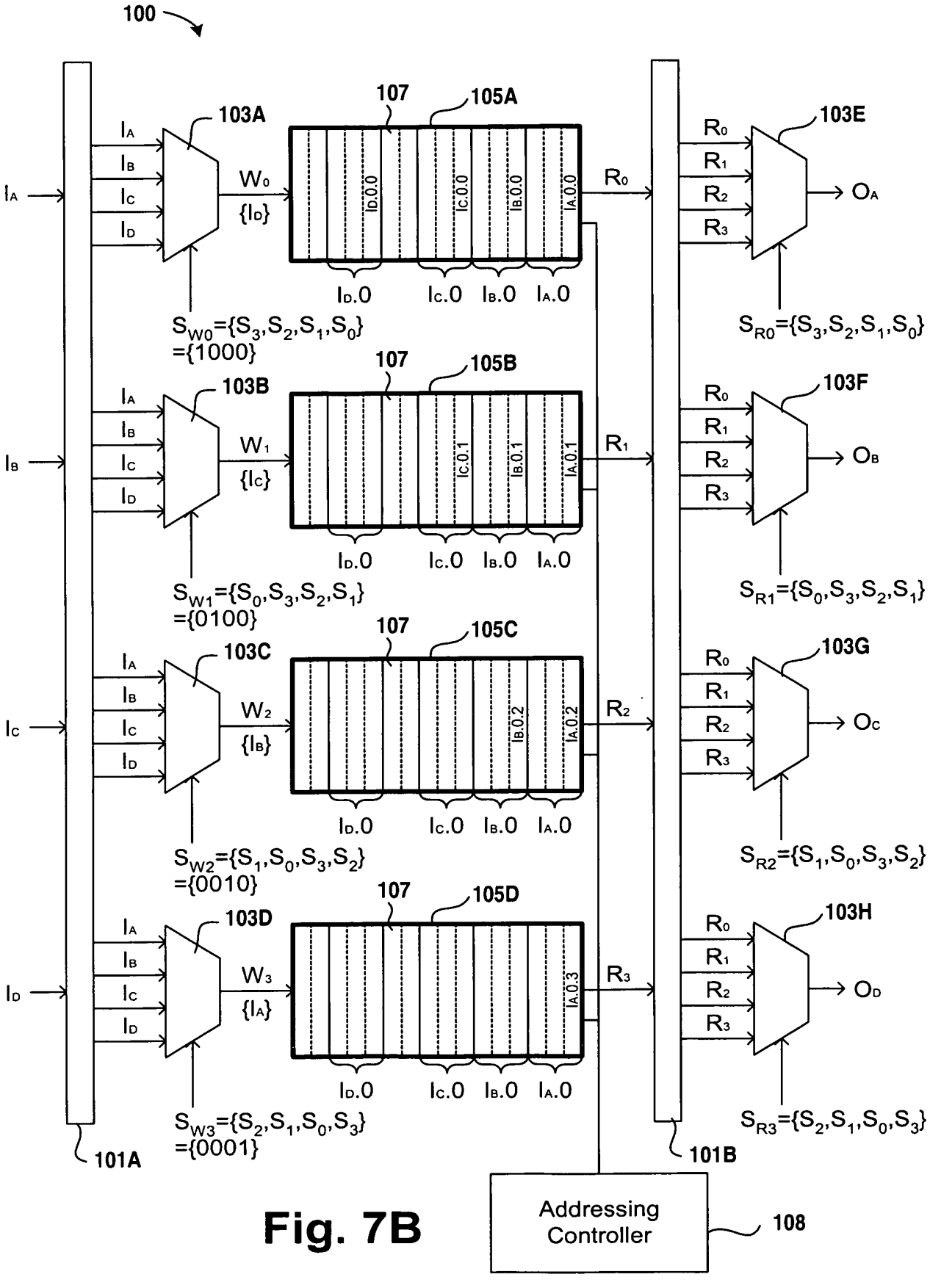
100
103A
105A
107
103B
105B
107
103C
105C
107
103D
105D
107
103E
103F
103G
103H
101A
101B
Addressing Controller
108
$S_{W0}=\{S_3,S_2,S_1,S_0\}=\{1000\}$
$S_{W1}=\{S_0,S_3,S_2,S_1\}=\{0100\}$
$S_{W2}=\{S_1,S_0,S_3,S_2\}=\{0010\}$
$S_{W3}=\{S_2,S_1,S_0,S_3\}=\{0001\}$
$S_{R0}=\{S_3,S_2,S_1,S_0\}$
$S_{R1}=\{S_0,S_3,S_2,S_1\}$
$S_{R2}=\{S_1,S_0,S_3,S_2\}$
$S_{R3}=\{S_2,S_1,S_0,S_3\}$

Fig. 7B

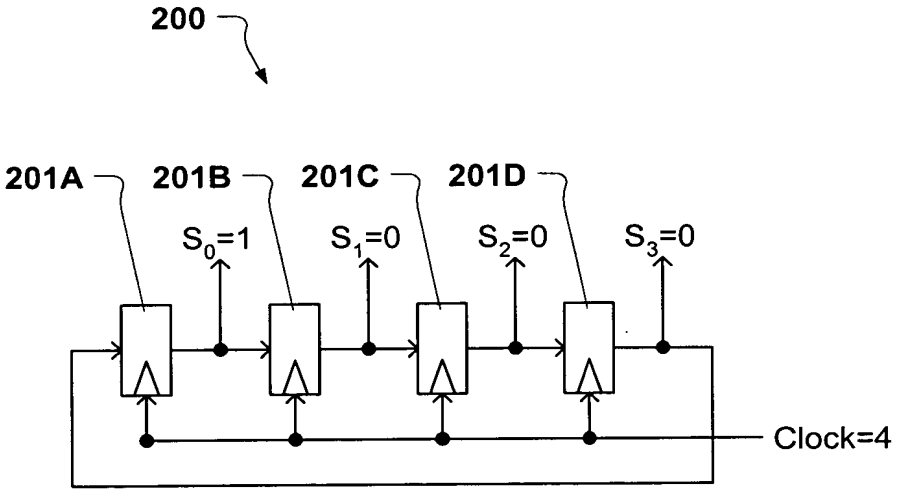

Fig. 8A

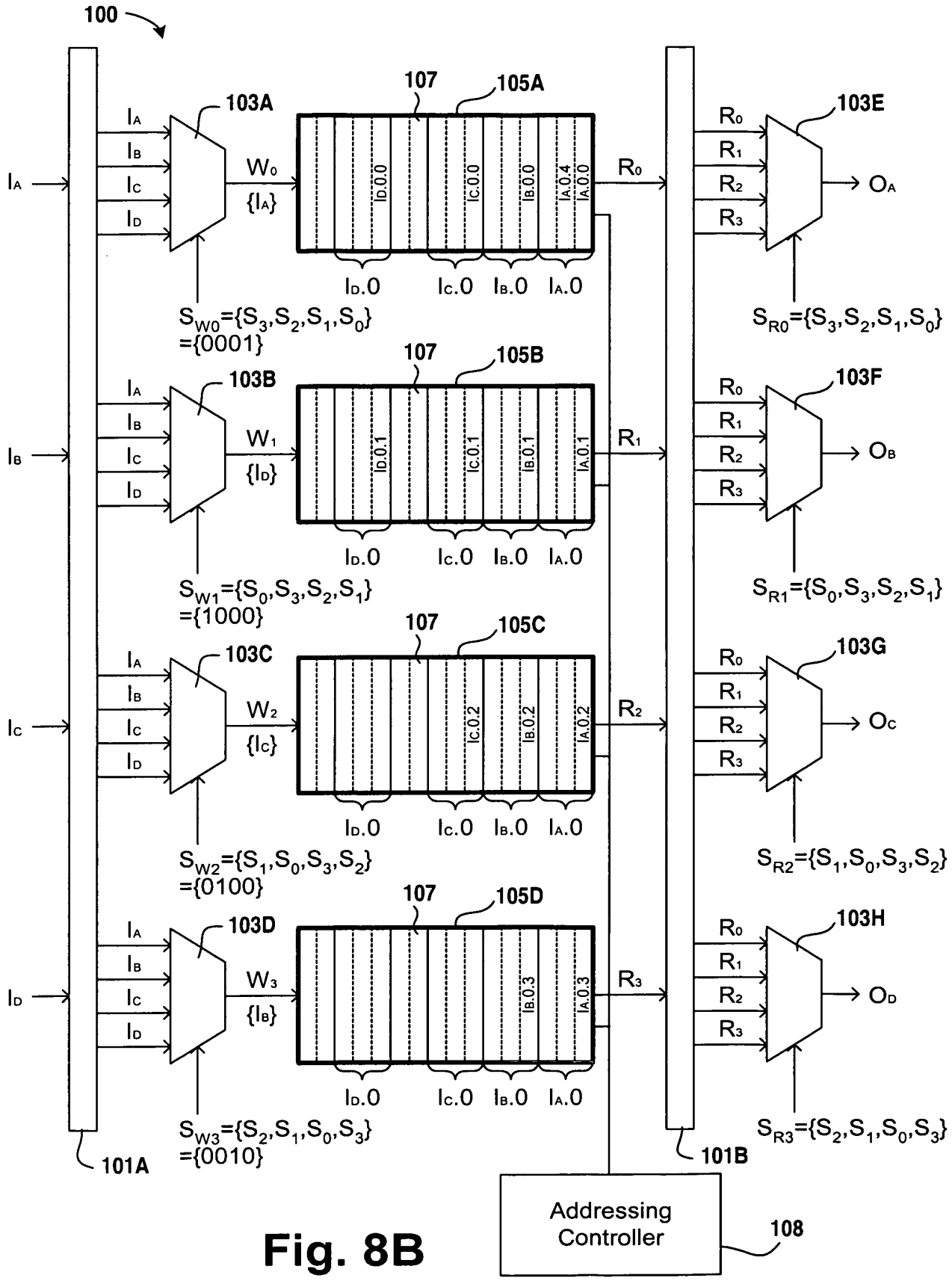
100
103A
103B
103C
103D
103E
103F
103G
103H
105A
105B
105C
105D
107
101A
101B
108
Addressing Controller
I_A
I_B
I_C
I_D
W_0 {I_A}
W_1 {I_D}
W_2 {I_C}
W_3 {I_B}
R_0
R_1
R_2
R_3
O_A
O_B
O_C
O_D
$I_{D.0.0}$ $I_{C.0.0}$ $I_{B.0.0}$ $I_{A.0.4}$ $I_{A.0.0}$
$I_{D.0.1}$ $I_{C.0.1}$ $I_{B.0.1}$ $I_{A.0.1}$
$I_{C.0.2}$ $I_{B.0.2}$ $I_{A.0.2}$
$I_{B.0.3}$ $I_{A.0.3}$
$I_{D.0}$ $I_{C.0}$ $I_{B.0}$ $I_{A.0}$
$S_{W0}=\{S_3,S_2,S_1,S_0\}=\{0001\}$
$S_{W1}=\{S_0,S_3,S_2,S_1\}=\{1000\}$
$S_{W2}=\{S_1,S_0,S_3,S_2\}=\{0100\}$
$S_{W3}=\{S_2,S_1,S_0,S_3\}=\{0010\}$
$S_{R0}=\{S_3,S_2,S_1,S_0\}$
$S_{R1}=\{S_0,S_3,S_2,S_1\}$
$S_{R2}=\{S_1,S_0,S_3,S_2\}$
$S_{R3}=\{S_2,S_1,S_0,S_3\}$

Fig. 8B

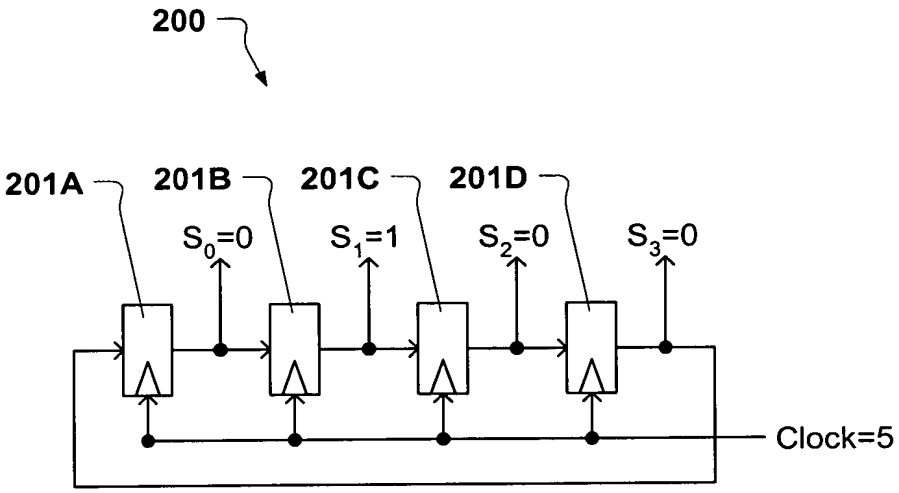

Fig. 9A

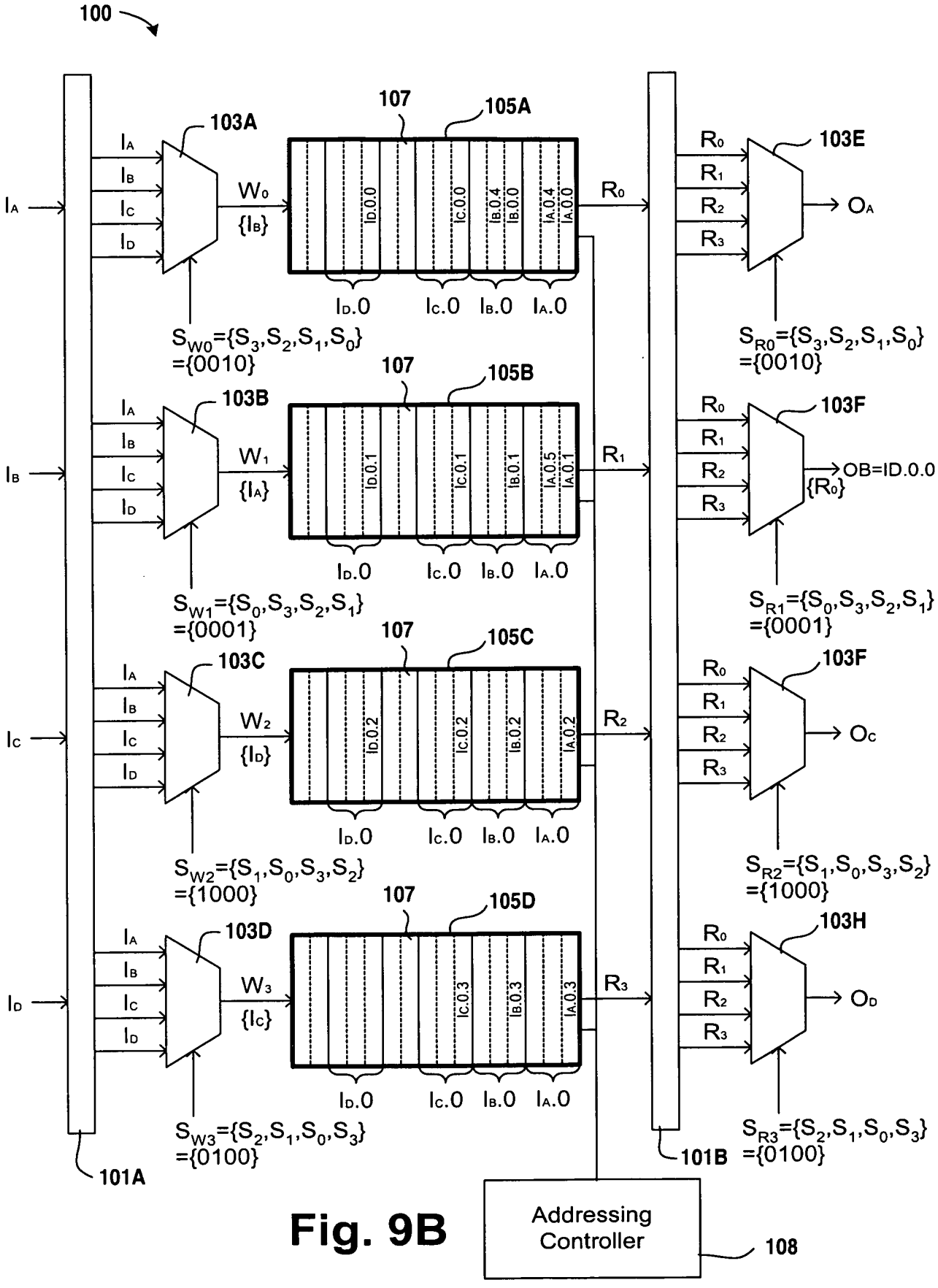
100
103A
103B
103C
103D
103E
103F
103F
103H
105A
105B
105C
105D
107
I_A
I_B
I_C
I_D
W_0 {I_B}
W_1 {I_A}
W_2 {I_D}
W_3 {I_C}
$I_{D.0.0}$ $I_{C.0.0}$ $I_{B.0.4}$ $I_{B.0.0}$ $I_{A.0.4}$ $I_{A.0.0}$
$I_{D.0.1}$ $I_{C.0.1}$ $I_{B.0.1}$ $I_{A.0.5}$ $I_{A.0.1}$
$I_{D.0.2}$ $I_{C.0.2}$ $I_{B.0.2}$ $I_{A.0.2}$
$I_{C.0.3}$ $I_{B.0.3}$ $I_{A.0.3}$
$I_{D.0}$ $I_{C.0}$ $I_{B.0}$ $I_{A.0}$
R_0 R_1 R_2 R_3
O_A
OB=ID.0.0
O_C
O_D
$S_{W0}=\{S_3,S_2,S_1,S_0\}=\{0010\}$
$S_{W1}=\{S_0,S_3,S_2,S_1\}=\{0001\}$
$S_{W2}=\{S_1,S_0,S_3,S_2\}=\{1000\}$
$S_{W3}=\{S_2,S_1,S_0,S_3\}=\{0100\}$
$S_{R0}=\{S_3,S_2,S_1,S_0\}=\{0010\}$
$S_{R1}=\{S_0,S_3,S_2,S_1\}=\{0001\}$
$S_{R2}=\{S_1,S_0,S_3,S_2\}=\{1000\}$
$S_{R3}=\{S_2,S_1,S_0,S_3\}=\{0100\}$
101A
101B
Addressing Controller
108

Fig. 9B

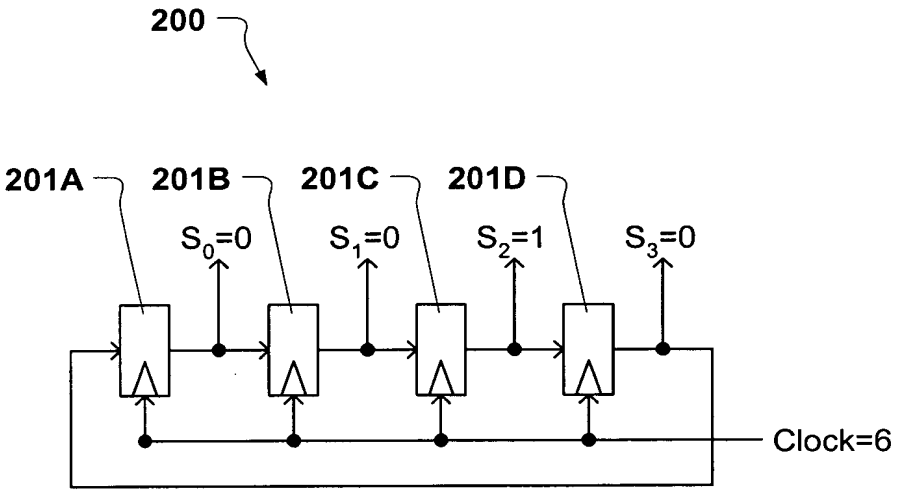

Fig. 10A

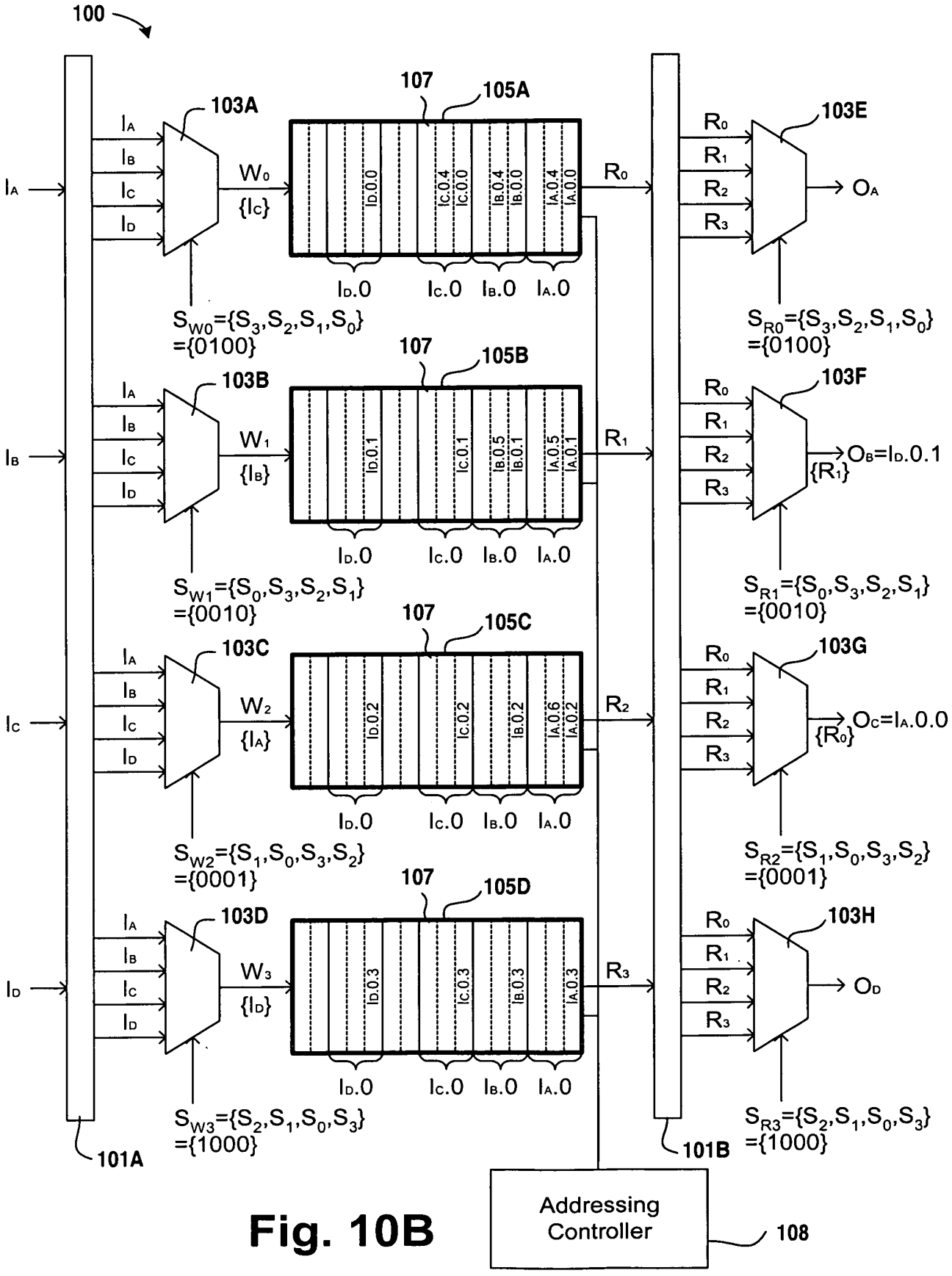
100
103A
105A
107
103B
105B
103C
105C
103D
105D
103E
103F
103G
103H
101A
101B
Addressing Controller
108

Fig. 10B

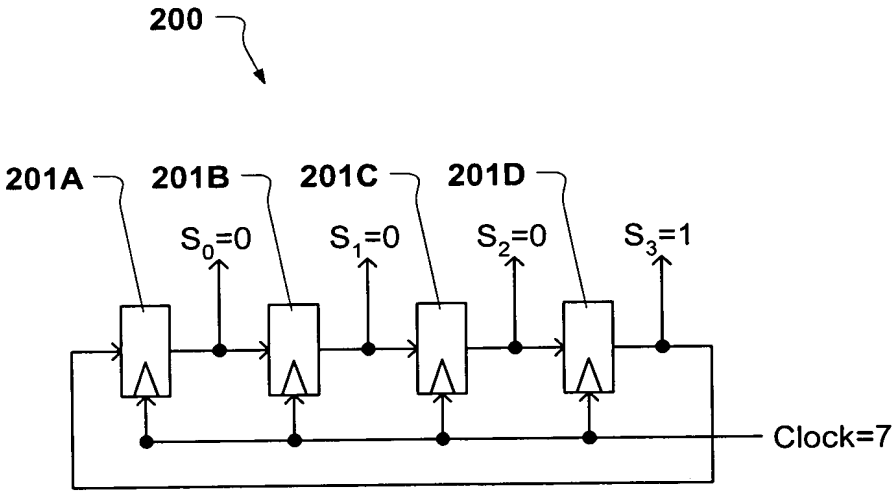

Fig. 11A

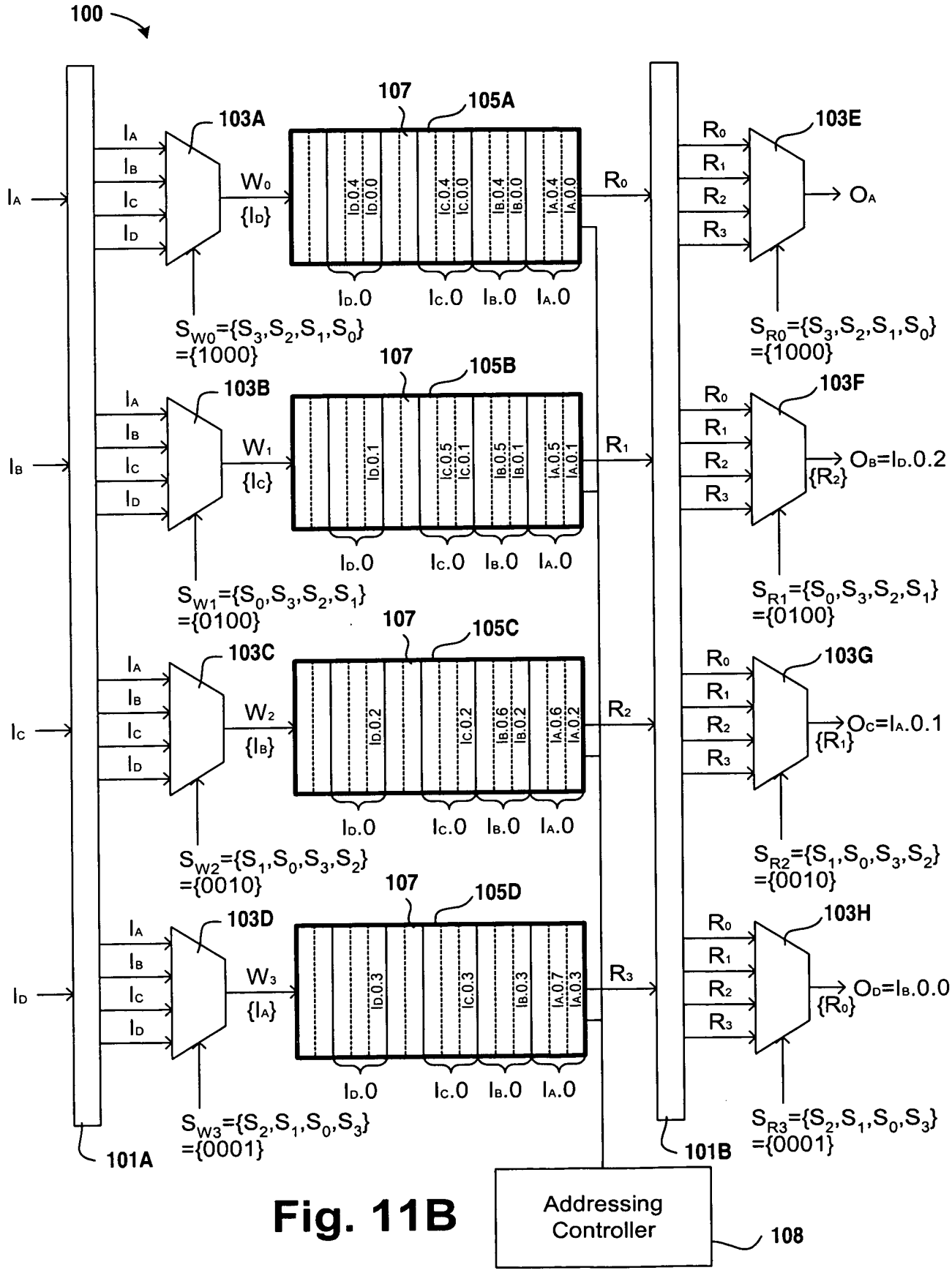
100
107
105A
103A
I_A
I_B
I_C
I_D
W_0
$\{I_D\}$
$I_{D.0.4}$ $I_{D.0.0}$ $I_{C.0.4}$ $I_{C.0.0}$ $I_{B.0.4}$ $I_{B.0.0}$ $I_{A.0.4}$ $I_{A.0.0}$
$I_{D.0}$ $I_{C.0}$ $I_{B.0}$ $I_{A.0}$
$S_{W0}=\{S_3,S_2,S_1,S_0\}$
$=\{1000\}$
R_0
R_1
R_2
R_3
103E
O_A
$S_{R0}=\{S_3,S_2,S_1,S_0\}$
$=\{1000\}$
107
105B
103B
W_1
$\{I_C\}$
$I_{D.0.1}$ $I_{C.0.5}$ $I_{C.0.1}$ $I_{B.0.5}$ $I_{B.0.1}$ $I_{A.0.5}$ $I_{A.0.1}$
$I_{D.0}$ $I_{C.0}$ $I_{B.0}$ $I_{A.0}$
$S_{W1}=\{S_0,S_3,S_2,S_1\}$
$=\{0100\}$
103F
$O_B=I_{D.0.2}$
$\{R_2\}$
$S_{R1}=\{S_0,S_3,S_2,S_1\}$
$=\{0100\}$
107
105C
103C
W_2
$\{I_B\}$
$I_{D.0.2}$ $I_{C.0.2}$ $I_{B.0.6}$ $I_{B.0.2}$ $I_{A.0.6}$ $I_{A.0.2}$
$I_{D.0}$ $I_{C.0}$ $I_{B.0}$ $I_{A.0}$
$S_{W2}=\{S_1,S_0,S_3,S_2\}$
$=\{0010\}$
103G
$O_C=I_{A.0.1}$
$\{R_1\}$
$S_{R2}=\{S_1,S_0,S_3,S_2\}$
$=\{0010\}$
107
105D
103D
W_3
$\{I_A\}$
$I_{D.0.3}$ $I_{C.0.3}$ $I_{B.0.3}$ $I_{A.0.7}$ $I_{A.0.3}$
$I_{D.0}$ $I_{C.0}$ $I_{B.0}$ $I_{A.0}$
$S_{W3}=\{S_2,S_1,S_0,S_3\}$
$=\{0001\}$
103H
$O_D=I_{B.0.0}$
$\{R_0\}$
$S_{R3}=\{S_2,S_1,S_0,S_3\}$
$=\{0001\}$
101A
101B
Addressing Controller
108

Fig. 11B

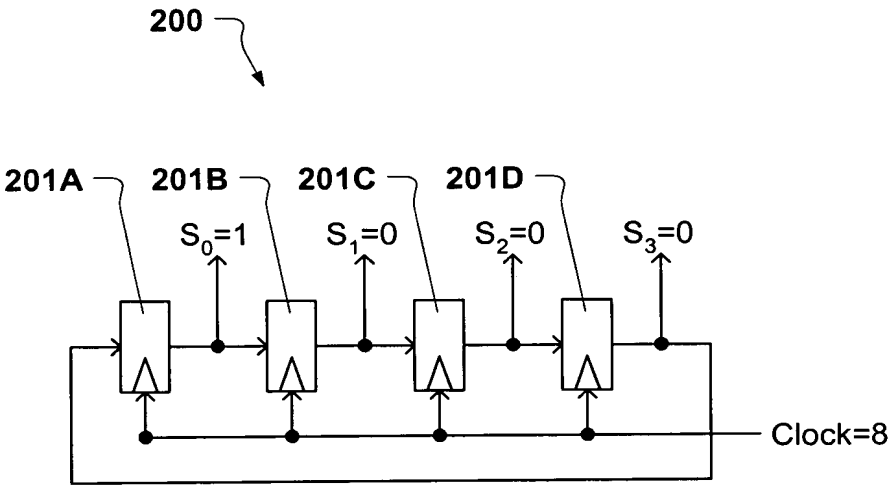

Fig. 12A

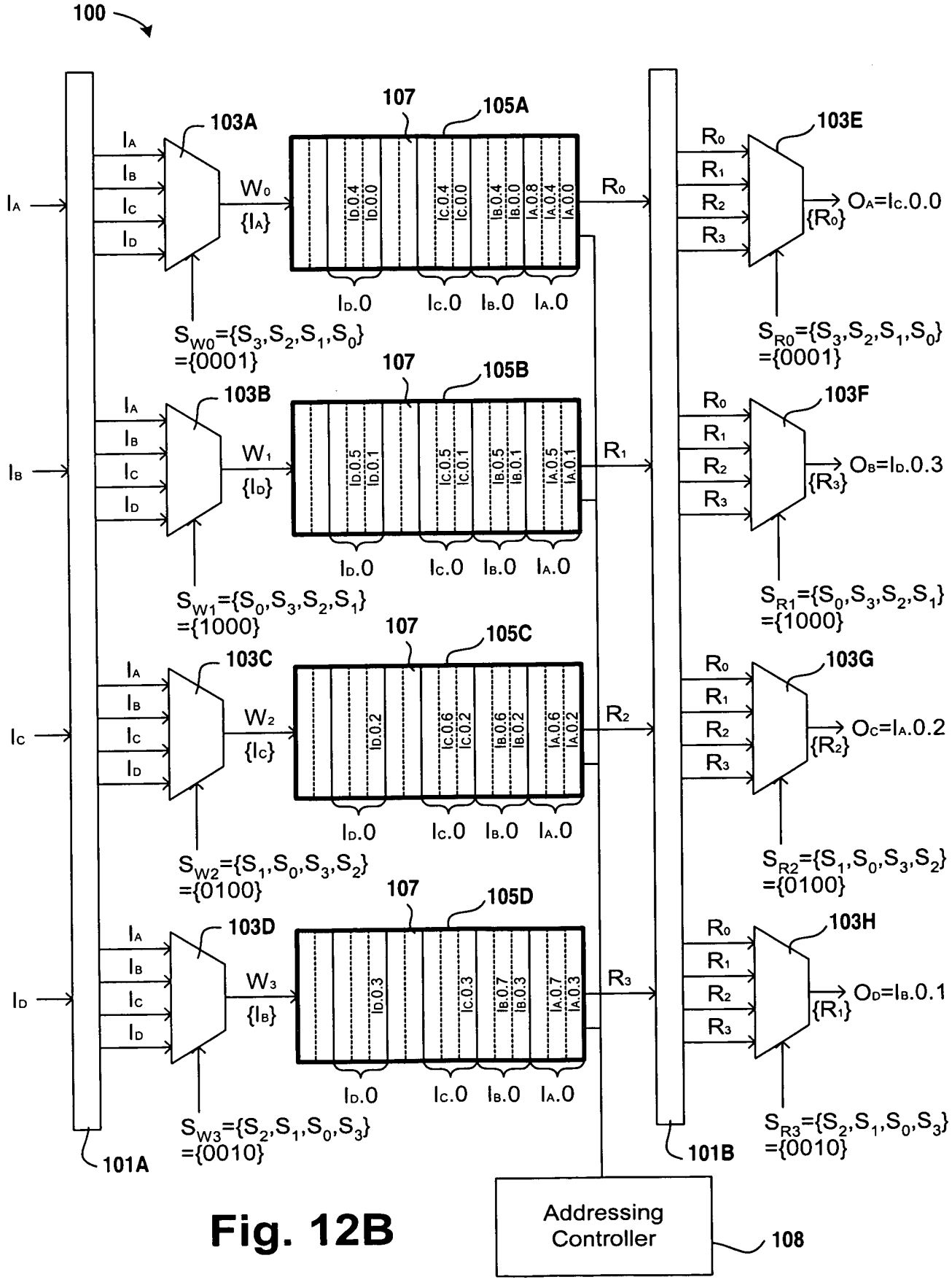
100
103A
105A
107
103B
105B
103C
105C
103D
105D
103E
103F
103G
103H
101A
101B
108
Addressing Controller
W_0 {I_A}
W_1 {I_D}
W_2 {I_C}
W_3 {I_B}
S_{W0}={S_3,S_2,S_1,S_0} ={0001}
S_{W1}={S_0,S_3,S_2,S_1} ={1000}
S_{W2}={S_1,S_0,S_3,S_2} ={0100}
S_{W3}={S_2,S_1,S_0,S_3} ={0010}
S_{R0}={S_3,S_2,S_1,S_0} ={0001}
S_{R1}={S_0,S_3,S_2,S_1} ={1000}
S_{R2}={S_1,S_0,S_3,S_2} ={0100}
S_{R3}={S_2,S_1,S_0,S_3} ={0010}
O_A=I_C.0.0 {R_0}
O_B=I_D.0.3 {R_3}
O_C=I_A.0.2 {R_2}
O_D=I_B.0.1 {R_1}

Fig. 12B

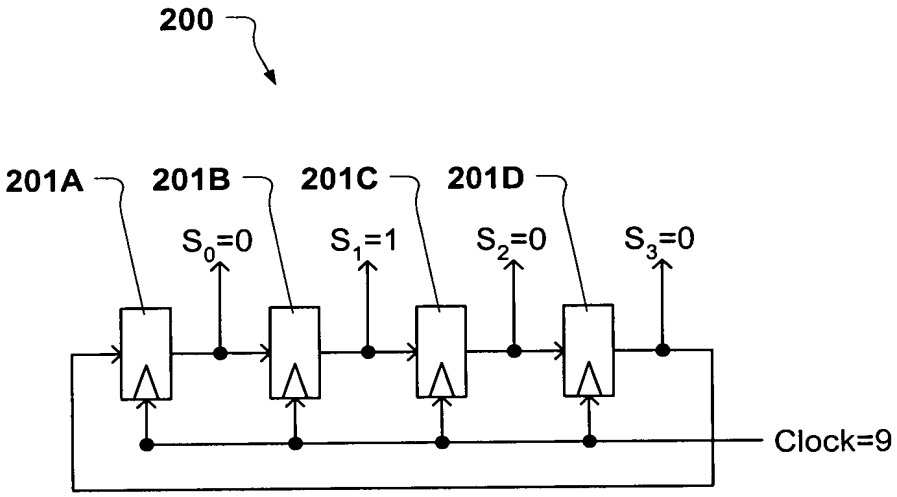

Fig. 13A

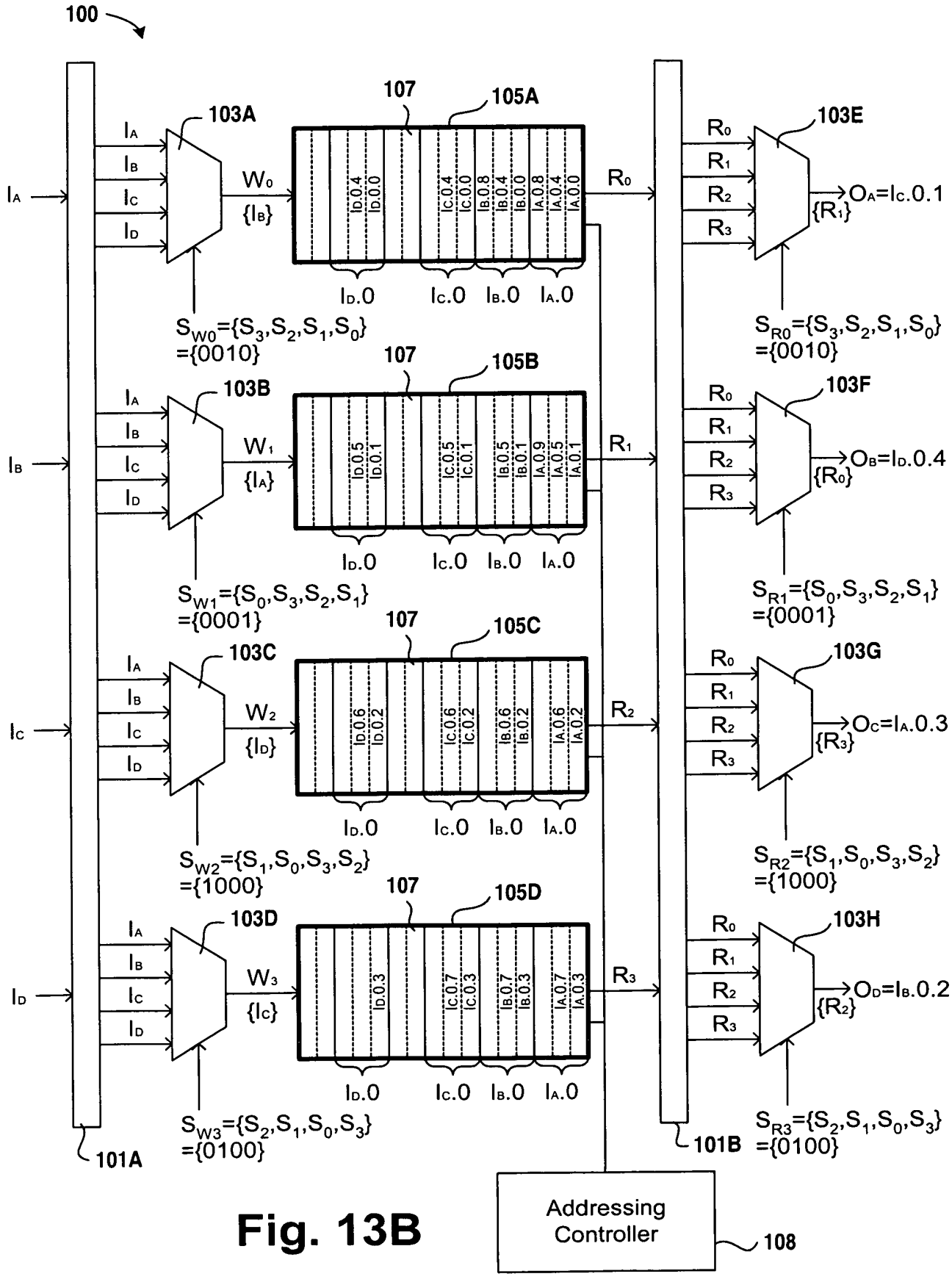
100
103A
103B
103C
103D
103E
103F
103G
103H
105A
105B
105C
105D
107
101A
101B
108
Addressing Controller
I_A
I_B
I_C
I_D
W_0 {I_B}
W_1 {I_A}
W_2 {I_D}
W_3 {I_C}
R_0
R_1
R_2
R_3
$O_A=I_C.0.1$ {R_1}
$O_B=I_D.0.4$ {R_0}
$O_C=I_A.0.3$ {R_3}
$O_D=I_B.0.2$ {R_2}
$S_{W0}=\{S_3,S_2,S_1,S_0\}=\{0010\}$
$S_{W1}=\{S_0,S_3,S_2,S_1\}=\{0001\}$
$S_{W2}=\{S_1,S_0,S_3,S_2\}=\{1000\}$
$S_{W3}=\{S_2,S_1,S_0,S_3\}=\{0100\}$
$S_{R0}=\{S_3,S_2,S_1,S_0\}=\{0010\}$
$S_{R1}=\{S_0,S_3,S_2,S_1\}=\{0001\}$
$S_{R2}=\{S_1,S_0,S_3,S_2\}=\{1000\}$
$S_{R3}=\{S_2,S_1,S_0,S_3\}=\{0100\}$
$I_D.0$ $I_C.0$ $I_B.0$ $I_A.0$

Fig. 13B

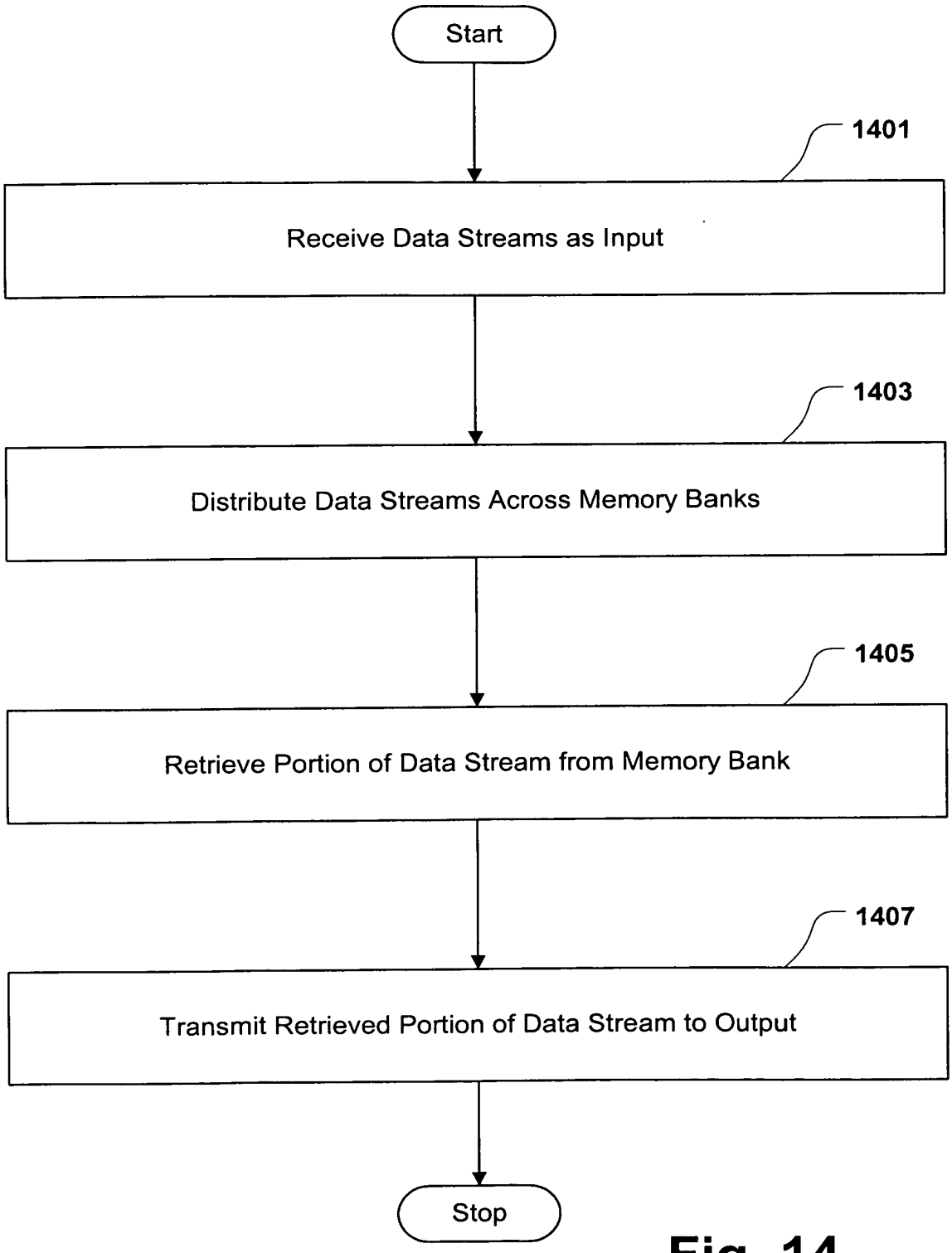
Start
1401
Receive Data Streams as Input
1403
Distribute Data Streams Across Memory Banks
1405
Retrieve Portion of Data Stream from Memory Bank
1407
Transmit Retrieved Portion of Data Stream to Output
Stop

Fig. 14